

MACHINE TOOL ESTIMATING

by Randolph A. Harding, Jr.

## Machine Tool Estimating

What does the lad of twelve want to be when he grows up? A soldier, a sailor, a doctor, or maybe an engineer. But how many children get a chance to carry out their dreams? They dream of being great men of which there are few. There are many many jobs that the average person never hears about. 'Never reads about them in books or sees them in the movies. I worked at such a job for approximately two years. Upon meeting some old friend, he would say, "What are you doing for a living?" "Estimating", I would say. Then I would have to go through an explanation. In fact, I became quite used to explaining this job. Do you know what an estimator in a machine shop would do? In the following paragraphs, I would like to introduce his job to you.

In this paper the term "estimating" is used to cover the planning of a proper method of doing a machine job, and the figuring of the time required to produce a piece. The term "estimating" is used because we are talking about the planning of a job which is to be produced, rather than the time study of a job that is already in production.

It is entirely possible to estimate machine work with a reasonable degree of accuracy before the job is put on a machine. In order to determine the proper set-up, and to provide the proper tooling it is very important that at least some of the steps required in estimating are taken on every job, either by the operator or by the tool engineering department.

There are seven principal steps to be taken in making an



estimate on any machine work, as follows:

1. Study a blueprint of the job, and if possible, a sample of the work; study the preceding and following operations and the quantity to be made.
2. Select the proper size and type of machines that are available.
3. Determine the holding method.
4. Outline all necessary operations.
5. Determine multiple and combined cuts.
6. Determine speeds and feeds.
7. Figure the actual time required to produce the piece.

It is always necessary to study the requirements of a job before the proper tooling method can be determined. In doing this it is necessary to know the limits of accuracy, and the finish required. A careful study of the job will bring out many other points that affect the tooling and the speeds and feeds to be used. The quantity will also determine the set-up time allowable.

The estimator will have to select the machines upon which the job can be done. In most cases he will have to work with the machines that are already available. On the other hand, if a new job is to be produced in large quantities and new machinery is to be purchased, then the estimator is not limited to his own shop.

Not only must the estimator determine the best method of holding the piece so that proper speeds and feeds can be used, but he must also determine how elaborate the holding device should be. A very important element in making this decision is



the number of pieces to be produced, and the estimator should carefully figure not only a method of holding the work that will be satisfactory, but also one which is justified on a cost analysis basis.

The fourth item - the outlining of all operations- means the actual listing of all cuts to be taken, and this quite naturally raises many questions as to how the cuts should be taken; whether the holes should be bored or reamed; the number of cuts required to produce the required accuracy and finish; whether forming tools or plain cutters are most economical, etc.

Multiple or combined cuts? This depends upon the machine used and the piece. The more cuts we can take at one time, the cheaper the piece.

Determining the speeds and feeds is important, but not a very difficult matter after the preceding steps have been taken. Tables have been made that show the various normal speeds and feeds for various materials. The estimator should also determine the type of cutting tool to be used. He may use high speed steel, stellite, or carbide cutters. The selection of these cutting tools would depend partly upon the machine being used, but if the machines are modern, he does not need to hesitate to use the best cutters when they will allow the use of heavier feeds or higher speeds.

After selecting the machine, determining the method of holding the piece, listing the operations, and determining the cuts, and types of cutters and the speeds and feeds to be used, there is still the job of figuring the actual time required to produce a piece. To assist the estimator, charts have been made which

show the time required of one inch of cut at each speed and feed on the machine. By applying this factor to the length of cut required, and adding the machine and work-handling time, the actual time required to produce the work results.

The estimator's work is finished. With the estimated time as a base, the cost of a job still in the blueprint stage is determined. A good estimator must know everything from engineering to the simplest operation in the shop.

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